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Economic Intelligence Report

TRANSPORTATION IN THE SOUTHERN BORDER REGION
OF COMMUNIST CHINA



CIA/RR ER 62-14

May 1962

CENTRAL INTELLIGENCE AGENCY
Office of Research and Reports

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FOREWORD

This report is one of a series of regional studies of transportation facilities in Communist China produced by the Office of Research and Reports, Central Intelligence Agency. The area selected for this study, the southern border region of Communist China, consists of Yunnan Province, Kwangsi Chuang Autonomous Region, and parts of Kweichow and Kwangtung Provinces. Unless otherwise indicated, all statistical data contained in this report are given in terms of provincial areas or point-to-point distances or capacities of given routes.

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TRANSPORTATION IN THE SOUTHERN BORDER REGION OF COMMUNIST CHINA*

Summary and Conclusions

The southern border region of Communist China,** as delineated in this report, consists of approximately 770,000 square kilometers, or about 8 percent of the land mass of China. This area, which roughly describes a half circle extending from Chan-chiang (Fort Bayard) to the northwest border of Yunnan Province, is a region of historic isolation and minimal transportation. Construction, maintenance, and operation of land forms of transportation are expensive because of the mountainous terrain and the heavy monsoonal rains. Inland water transport is important only in the eastern section of Kwangsi Province.

The region has developed a subsistence economy in an area relatively sparsely populated by Chinese and minority groups. Nevertheless, as the result of political as well as economic considerations, the Chinese Communists are pushing ahead with a program to improve transportation within the southern border region and to strengthen the transportation links of the region with other sections of the mainland. Although improved transportation facilities are necessary to exploit the mineral resources in the area and to integrate the economy of the region with other sections of the nation, this relatively expensive program of road and rail construction represents more an attempt to control potentially dissident areas and to facilitate subversion of the border areas rather than to develop the local economy.

Rail transport in the southern border presents two contrasting situations. The rail system of Kwangsi is relatively complete and consists of three single-track lines, totaling about 1,940 kilometers (km), which serve all the major urban centers of Kwangsi with the exception of the river port city of Wu-chou. The most important railroad in Kwangsi, the north-south Heng-yang - Nan-ning - P'ing-hsiang line, has an estimated capacity of 10,100 tons*** each way per day (EWPD). The estimated capacity of the Li-t'ang - Chan-chiang rail line is 11,900 tons EWPD, and the capacity of the Liu-chou - Kuei-yang rail line is 5,900 tons EWPD. The

* The estimates and conclusions in this report represent the best judgment of this Office as of 1 April 1962.

** Comprising Yunnan Province, Kwangsi Chuang Autonomous Region, Kweichow Province south of the provincial capital of Kuei-yang, and Kwangtung Province west of the Li-t'ang - Chan-chiang (Fort Bayard) Railroad.

*** Tonnages are given in metric tons throughout this report.

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capacity of these rail lines exceeds present traffic demands, and the existing lines should be adequate to support economic expansion in the area. It therefore seems unlikely that the railroad system of Kwangsi will be expanded significantly in the near future.

Yunnan Province, on the other hand, will see much railroad construction during the next 5 years. The railroad system of Yunnan consists of four single-track lines totaling about 951 km, but the only rail connection between Yunnan and other sections of China is via the North Vietnam rail network. This tenuous rail link with other sections of China -- the K'un-ming - Hanoi - P'ing-hsiang rail line -- with an estimated capacity of about 1,400 tons EWP, is unacceptable to the Chinese Communists from an economic as well as from a political and military point of view. This line has little excess capacity, is susceptible to seasonal damage, and is subject to possible observation by the International Control Commission at Dong Dang and Lao Kay, the border crossing points in North Vietnam. Under construction at present are three rail lines that will connect Yunnan directly with the main Chinese rail network: a line from Nei-chiang in Szechwan Province; a line from Kuei-yang in Kweichow Province; and a line from Ch'eng-tu in Szechwan Province. Until at least one of these lines is completed, probably during the Third Five Year Plan (1963-67), the ability of the Chinese Communists to exploit the mineral wealth of Yunnan or to move quickly large bodies of troops into Yunnan will remain seriously restricted.

In 1960, Kwangsi and Yunnan had a combined total of at least 36,000 km of motorable roads that were used by approximately 9,000 trucks. In Kwangsi, where rail and inland water transport serve as the primary long-distance carriers, trucks are used chiefly as a means of feeder transport. In Yunnan, however, trucks are the primary carriers of freight outside of the central area served by rail. Construction of roads in Kwangsi has been confined generally to increasing the net of primitive roads in the minority areas rather than to constructing better highways. The only "long roads" of the type found in Yunnan probably will be in the southwestern area of the region. In Yunnan, where roads play a major role in the economic and military posture, much improvement of existing roads and construction of new roads has been reported. A large percentage of this new construction is in the rugged and sparsely populated western and southwestern sections of the province, particularly along the areas bordering Laos and Burma.

Air transport, inland water transport, and coastal shipping provide limited or local transport service in the southern border region. Air transport is an important but not extensive form of transportation throughout the area. Along the coast, junks transport much of the freight traffic, which normally consists of agricultural and mineral products moving north and finished goods moving south. Inland water transport has

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economic significance only in the eastern section of Kwangsi, an area served by the Hsi Chiang (West River) complex of the Pearl River System,* which acts as the main east-west transportation artery. In 1957, Kwangsi had 7,794 km of inland waterways, 2,475 km of which were navigable by powered vessels. Although the Chinese Communists have made considerable progress in rehabilitating the waterways of Kwangsi, any substantial increase in the volume of traffic will depend on expensive, long-term water-conservation and river-harnessing projects.

* See the second footnote on p. 24, below.

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I. Introduction

The southern border region of Communist China, as delineated in this report, consists of Yunnan Province, Kwangsi Chuang Autonomous Region, Kweichow Province south of the provincial capital of Kueiyang, and Kwangtung Province west of the Li-t'ang - Chan-chiang railroad.* This area, approximately 770,000 square kilometers, or 8 percent of the total area of China, roughly describes a half circle extending from Chan-chiang** to the northwest border of Yunnan Province.

Development of the land forms of transportation in this region has been restricted by the high costs of construction, maintenance, and operation caused by the mountainous terrain and the heavy monsoonal rains. Rivers, ordinarily of importance in a primitive transportation system, are, with the exception of those in eastern Kwangsi, largely unnavigable. These factors notwithstanding, Communist China is pushing ahead with its program to improve transportation within the southern border region and to strengthen the transportation links of the region with other sections of the mainland.

The topography of southern China has had a marked effect on transportation. Most of the area consists of plateaus or hills dissected by canyons and valleys. With the exception of some sections of the delta area and western Yunnan, Karst topography is prevalent.*** The elevation of this area is step-shaped with the lowest part to the east in the lowlands of southern Kwangtung and southeastern Kwangsi. The elevation rises progressively to the west, averaging approximately 1,500 to 3,000 feet in central Kwangsi and southern Kweichow, 6,000 feet in central Yunnan, and 15,000 feet in western Yunnan. The tropical climate of the southern border region is moderated by the mountains in the western section, giving K'un-ming in Yunnan Province a climate similar to that of Mexico City. Rain, which occurs generally between May and September, ranges between 30 and 120 inches per year.

* The focus of this study is on Yunnan Province, Kwangsi Chuang Autonomous Region, and the section of Kwangtung Province bordering North Vietnam. The southern part of Kweichow Province is introduced into this report because it is the primary land transportation link between Yunnan and Kwangsi in China.

** This city is also called Hsi-yang, Kuan-chow-wan, and Tsamkong.

*** Karst topography, which is rare in the US and Western Europe, takes place in areas of soluble limestone. Water forms sink holes that enlarge with time to solution valleys and, in the mature state, to areas of small plains and steep, even spirelike, hills.

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Historically, southern China has been an area of minimal transportation. It was the last part of China to be conquered and colonized and until recent times had the most tenuous communications with the areas of central authority. This historical isolation resulted in a self-sufficient but primitive and industrially underdeveloped economy. Agriculture is the principal economic activity in Yunnan even though only 5 percent of the land is so utilized.* The principal agricultural region is the eastern section of the province, where rice, wheat, barley, and corn are the primary crops. The extraction of minerals, however, is strategically the most important economic activity of the province. Approximately 80 percent of China's tin is mined in the Ko-chiu district south of K'un-ming, and significant quantities of copper are produced at the mines around Hui-tse in northeastern Yunnan. Lead and zinc are produced in three areas of Yunnan, and coal and iron ore are mined in the general area of K'un-ming.

Agriculture also is the principal economic activity in the Kwangsi Chuang Autonomous Region. There is, however, more land under cultivation than in Yunnan, but the amount is not believed to exceed 11 percent. The southeastern part of Kwangsi is located in the region of China's double-crop rice while single-crop rice is grown elsewhere in Kwangsi. Other important crops are sugar cane, subtropical fruits, tea, corn, barley, and millet. There also are mining operations of significance in Kwangsi. China's principal producing area of manganese is located in the eastern part of the province. Kwangsi probably ranks second to Yunnan as a producer of tin. Antimony is mined in northern Kwangsi, and tungsten, lead, and zinc are mined in the eastern section of the region.

II. Rail Transport

A. Yunnan Province

1. Network**

The railroad system of Yunnan Province consists of four single-track lines with a total network of 951 kilometers (km). The most important rail line in Yunnan is the 469-km meter-gauge line from K'un-ming, the provincial capital and principal transportation center, south through Pi-se-chai to Ho-k'ou on the Chinese - North Vietnam border.*** This line was reunited with the Lao Kay - Hanoi section of

* In Yunnan, 70 percent of the land is covered with grass or shrubs or is barren. Forests cover 25 percent of the area, mainly in the northwest, west, and south.

** For the graphic location of the railroad network serving Yunnan Province, see the map, inside back cover.

*** For railroad stations on this line, see Table 8, p. 34, below.

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the North Vietnam rail system in 1958, 1/ thus providing Yunnan with its only rail outlet to the Chinese standard-gauge system as well as an outlet to the sea at the port of Haiphong via the meter-gauge North Vietnam network. The K'un-ming - Chan-i meter-gauge line, 172 km in length, was opened for traffic in February 1955. 2/ Running west from K'un-ming is a 126-km meter-gauge line to I-p'ing-lang; work on this line was started in April 1958 and completed in July 1959. 3/ The fourth line in the Yunnan system is a 177-km 60-centimeter branch line running west from Pi-se-chai through Meng-tzu and Chi-chieh to Shih-p'ing and Ko-chiu. Construction was begun in 1914, but the line was not opened to Shih-p'ing until 1935. 4/ In addition to these lines, there are 7 km of rail line in K'un-ming and vicinity.

The most significant aspect of rail transport in Yunnan is the construction of new rail lines. The Chinese Communists have a major construction effort underway to provide K'un-ming with additional rail links with the rest of China. Two major rail lines connecting K'un-ming and Szechwan Province and one connecting Yunnan and Kweichow Province, totaling approximately 1,600 to 2,000 km, are under construction. Rail laying on the K'un-ming - Chan-i section of the K'un-ming - Nei-chiang rail line has advanced at least as far as Yang-lin, a distance of 50 km from K'un-ming. 5/ This line, which extends 830 km from K'un-ming to Nei-chiang in Szechwan Province, reportedly will have 220 tunnels, 240 large and medium-size bridges, and 1,600 small bridges. Farther north on the K'un-ming - Nei-chiang line, construction of the section between Hsuan-wei in Yunnan Province and Wei-ning in Kweichow Province has encountered topographical difficulties. In this mountainous section of the line, 137 km in length, approximately one-fourth of the section will consist of tunnels.

Another line, the K'un-ming - Kuei-yang railroad, also is under construction. This east-west line connecting K'un-ming with Kuei-yang in Kweichow Province has advanced westward from Kuei-yang as far as An-shun. A third major rail line, from K'un-ming to Ch'eng-tu in Szechwan Province, is under construction. Construction is reported underway at the Sha-mu-lai-tu tunnel** south of Ch'eng-tu. 6/

In the fall of 1958, construction began on a branch line from a point on the K'un-ming - Chan-i rail line between Yang-lin and Chan-i to the copper mines at Tung-ch'uan. Although the Chinese Communists claim that stone and earthwork operations have been basically completed, 7/ no further information is available concerning the progress of construction or the rail gauge to be used.

** The Sha-mu-lai-tu tunnel, the longest in China, is to be 6.4 km long. As of 29 May 1959, penetrations of 100 meters had been made at both ends.

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2. Performance

a. Volume of Traffic

As shown in Table 1, the tonnage carried by the railroads of Yunnan Province in 1960 was almost 17 times that of 1949, an increase from 320,000 tons in 1949 to about 5.38 million tons in 1960. The greatest percentage increases in traffic occurred during the "leap forward" years of 1958-59.

Table 1

Communist China: Estimated Tonnage Carried by the Railroads
of Yunnan Province
1949-60

<u>Year</u>	<u>Tonnage Carried (Thousand Metric Tons)</u>	<u>Annual Increase</u>	
		<u>Thousand Metric Tons</u>	<u>Percent</u>
1949	320 <u>a/</u>	N.A.	N.A.
1950	360 <u>a/</u>	40	12
1951	N.A.	N.A.	N.A.
1952	N.A.	N.A.	N.A.
1953	1,018 <u>a/</u>	N.A.	N.A.
1954	1,170 <u>a/</u>	152	15
1955	1,400 <u>b/</u>	230	20
1956	1,750 <u>b/</u>	350	25
1957	2,270 <u>a/</u>	520	30
1958	3,200 <u>b/</u>	930	41
1959	4,480 <u>a/</u>	1,280	40
1960	5,380 <u>b/</u>	900	20

a. 8/

b. Estimated.

b. Commodity Composition of Traffic

The commodity composition of freight carried on the railroads of Yunnan Province consists primarily of mineral and agricultural goods originating in Yunnan and manufactured products imported from other sections of China. Coal, which constitutes about 40 percent of the railroad freight of the nation, probably is the largest single

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item of freight carried on the railroads of Yunnan. A large percentage of the coal transported in the province moves from the mining areas to K'un-ming for use in production of iron and steel, in power generating plants, and in other industries.* Other goods carried on the railroad include tin, copper, lead, zinc, and phosphate rock, as well as food-stuffs and forest products. Tin, usually in the form of primary tin, is the most important export of the province, and in 1960, Yunnan exported a quantity estimated at about 26,000 tons 9/ from the rich Ko-chiu area,** southeast of K'un-ming, to other sections of China and to foreign countries. In addition, minerals such as copper, lead, zinc, and phosphate rock were exported by rail. 10/ Imports into Yunnan by way of the railroad system of North Vietnam consist primarily of such goods as steel rails and construction material, road building equipment, cement, cotton, petroleum products, 11/ agricultural equipment, and fertilizer. 12/

3. Inventory and Operations

In 1947 the inventory of rolling stock of the K'un-ming Railroad Administration totaled about 188 steam locomotives 13/ and 1,730 freight cars. 14/ Although the rolling stock park undoubtedly suffered much damage during the Chinese Civil War, apparently sufficient rolling stock is available to service the economy of the province. In addition, since the opening of service with North Vietnam, it is likely that the rolling stock of North Vietnam is used both in Yunnan and in North Vietnam in "China-to-China" transit traffic between Yunnan and Kwangsi Provinces.

Little information is available to analyze the operation of the K'un-ming Railroad Administration. In 1959 the Pi-se-chai - Shan-yao section of the K'un-ming - Hanoi line recorded an average of almost 1,000 tons per day, or roughly 500 tons each way per day (EWPd). By January 1960 the freight carried over this section had increased to an average of 1,128 tons per day. During 7 to 10 February 1960 the average daily tonnage reached 1,500 tons, or about 750 tons EWPd. 15/ The K'un-ming South Station, the chief terminal for the K'un-ming - Hanoi rail line, reported a loading-unloading rate in May 1960 of 1,675 tons per day, or approximately 50,000 tons per month. 16/ Of this total, 30 percent is reported to be "mechanized," although what operations are mechanized or what is meant by the term "mechanized" is not known.

* Chemical, textiles, sugar refining, and the like.

** This area accounts for about 80 percent of the tin mined in Communist China.

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4. Estimated Capability

The only line of the K'un-ming Railroad Administration on which sufficient information is available to form an estimate of capability is the main line of Yunnan Province, the K'un-ming - Hanoi Railroad. Although the limiting section of the line between Pi-se-chai and Shan-yao carried a total of approximately 1,500 tons per day in February 1960, the theoretical sustained capacity of the section probably is about 1,400 tons EWPd.* It is estimated that about 6 trains EWPd could theoretically be employed on this railroad with a train weight of approximately 225 net tons, or about 15 freight cars carrying 15 tons each. As the locomotive park of the K'un-ming Railroad Administration increases and more efficient locomotives become available, the weight of trains over this section probably will be increased. In addition, improvements in the condition of the line, servicing facilities, or siding trackage will increase the capability of this line beyond the estimated capacity of 1,400 tons EWPd.

B. Kwangsi Chuang Autonomous Region

1. Network**

There are three standard-gauge railroad lines in the Kwangsi Chuang Autonomous Region. These rail lines, which for the most part are under the control of the Liu-chou Railroad Administration, total approximately 1,940 km, excluding branch and spur lines. In comparison with Yunnan Province, the Kwangsi region is relatively well supplied with rail network and facilities.

The main rail line in the Kwangsi region is the Heng-yang - Nan-ning - P'ing-hsiang Railroad. This line extends 1,013 km south from Heng-yang in Hunan Province through Liu-chou, Li-t'ang, and Nan-ning to P'ing-hsiang,*** the change-of-gauge point connecting the Chinese and North Vietnam rail systems. This line was completed to the North Vietnam border in 1951, and since 1955 through service has been in effect to Hanoi, North Vietnam, 18/ using meter-gauge rolling stock over the P'ing-hsiang - Hanoi section. In 1958, rail traffic was opened to Yunnan Province by way of the North Vietnam railroad system.

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** For the graphic location of the railroad network serving Kwangsi Chuang Autonomous Region, see the map, inside back cover. For lists of railroad stations, see Tables 5, 6, and 7, Appendix A, pp. 28, 31, and 32, respectively, below.

*** P'ing-hsiang is approximately 16 km from the Chinese - North Vietnam border.

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The Li-t'ang - Chan-chiang Railroad extends 315 km from Li-t'ang in Kwangsi to Chan-chiang in Kwangtung Province. This railroad also has 31 km of service and spur line. A branch line approximately 100 km long extends northeast as far as Mao-ming in Kwangtung Province. The Li-t'ang - Chan-chiang line, which was completed in July 1955, 19/ provides a rail link between Chan-chiang, one of the better natural harbors on the southern coast of China, and the mineral reserves of southeastern Kwangsi.

The Liu-chou - Kuei-yang line extends 607 km northwest to Kuei-yang in Kweichow Province. In February 1959 the Tu-yun - Kuei-yang section, 146 km of new construction, was opened to traffic. In addition to the mainline, a branch line, about 40 km in length, connects Kuei-yang with Hui-shui. This branch line is a section of a planned line that is to connect Kuei-yang with Nan-ning in the Kwangsi region.

In 1958 the draft budget of Kwangsi allocated 19,053,000 yuan* for investment in transport, postal, and telegraphic services. 20/ It is likely that a large part of this allocation was used for the construction or reconstruction of roads and railroads. In March 1960, reconstruction began on the Huang-mien - Po-chai section** of the Heng-yang - Nan-ning - P'ing-hsiang line. 21/ This reconstruction reportedly will double traffic capacity and raise the maximum speed over this section from 65 km to 107 km per hour. Track-laying on the Kuei-yang - K'un-ming line has advanced westward from Kuei-yang as far as An-shun.

2. Performance

a. Volume of Traffic

In 1958 the railroads of the Liu-chou Railroad Bureau in the Kwangsi region carried about 5,750,000 tons of freight, and traffic reportedly increased to 9,210,000 tons in 1959. 22/ An estimate of tons carried for the first quarter of 1960 indicates a possible 36-percent increase above the fourth quarter of 1959. 23/ Information is not available on the volume of traffic over the individual railroad lines, but the volume of traffic through the change-of-gauge point at P'ing-hsiang in 1961 is estimated to have been 1,000 to 1,500 tons per day passing south from Kwangsi to North Vietnam and Yunnan

* Unless otherwise indicated, yuan values in this report are given in current yuan and may be converted to US dollars at a rate of exchange of 2.46 yuan to US \$1. This rate does not necessarily reflect the value of the yuan in terms of the dollar.

** Approximately 79 km north of Liu-chou.

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Province. 24/ As many empty cars were being sent north into Kwangsi Province, 25/ probably about 280,000 tons of freight per year, or about 770 tons per day, were transported from Yunnan and North Vietnam to Kwangsi.

b. Commodity Composition of Traffic

The information available concerning the commodity composition of rail transport in the Kwangsi Chuang Autonomous Region is limited. As is the case with Yunnan, Kwangsi is an agricultural region. Products of agriculture and mines generally are exported from the region, and manufactured and processed materials are imported.

The Heng-yang - Nan-ning - P'ing-hsiang Railroad is the primary rail transport artery in the Kwangsi region. Movement of goods over this line generally can be described as manufactured and processed goods moving to the south from the industrial centers and major ports of China, while raw and semifinished goods flow north from Yunnan, North Vietnam, and Kwangsi. Commodities such as steel, in the form of rails, sheets, plate, pipe and beams, petroleum products,* automobile parts, machinery, fertilizer, 26/ and others** are shipped south to Kwangsi and through Kwangsi to North Vietnam and Yunnan. Livestock, phosphate rock, tin, lumber, bamboo, sugar, and tobacco are shipped north through Kwangsi from North Vietnam and Yunnan. In addition to commodities in transit on the Heng-yang - Nan-ning - P'ing-hsiang line, products from Kwangsi such as tin, lumber, pig iron, iron ore, lead, zinc, and manganese are shipped within the region and exported to the north on this railroad. The Li-t'ang - Chan-chiang Railroad handles the export from Kwangsi of sugar, lumber, manganese, and resin. These items are exported both by ship from Chan-chiang and by rail through Li-t'ang north to other sections of China. Imports into the area served by this line are agricultural machinery, consumer goods, oil, steel, and cement.

Little information is available concerning the commodity composition on the Liu-chou - Kuei-yang rail line. Steel, machinery, and consumer goods 27/ are imported into Kweichow Province over this line, while "minerals,*** farm products, tobacco, and metals" 28/ are shipped to other sections of the country.

* Including oil, kerosine, gasoline, and creosote.

** Other types of freight shipped into the Kwangsi region, Yunnan Province, and North Vietnam are window glass, clocks, cotton waste, power-line equipment (high voltage), tar, locomotives, generators, tin sheeting, clothing, boots and shoes, and aluminum.

*** Probably such minerals as mercury, antimony, tungsten, tin, bauxites, and gypsum.

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3. Inventory and Operations

In 1959 the Liu-chou Railroad Bureau probably possessed approximately 1,000 freight cars 29/ and 45 steam locomotives,* but little information is available on the types of rolling stock used by the Liu-chou Bureau or on their condition. There has been a steady decline in the freight car turnaround time of the Liu-chou Bureau similar to the trend experienced at the national level. In 1959 the average load per car and the average net load per train approximated the national average.

In addition to running regular freight trains, the Liu-chou Bureau organized the so-called "Dragon Network" in the summer of 1960. This organization, consisting of 280 freight cars and an unknown number of locomotives, was to guarantee the transportation of key types of goods by continuous operation between fixed points in the province. [redacted] 30 cars were assembled into two "Coal Dragons" (trains) for the purpose of hauling coal from the Ho-shan coal mine** to Kuei-lin and Lu-chia,*** reportedly areas of "long-standing coal shortages." 30/ There is no further information concerning the "Dragon Network," and it is therefore assumed that this organization was discontinued sometime in 1960 after the expected heavy transport volume of May and June had passed and that its rolling stock was reincorporated into the normal freight park of the Liu-chou Bureau.

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4. Estimated Capability

The Heng-yang - Nan-ning - P'ing-hsiang rail line of the Liu-chou Railroad Bureau has an estimated capability of 10,100 tons EWPd, which appears adequate for the area of Kwangsi served by this line. However, shipment of north-south freight between Kwangsi and North Vietnam and Yunnan Province has been limited by the capability of the meter-gauge lines in North Vietnam and the ability of the meter-gauge rolling stock park of North Vietnam and the K'un-ming Railroad Administration (Yunnan Province) to handle these imports and exports. This limiting situation probably will be moderated in the near future.

[redacted] the track facilities at the transloading point at P'ing-hsiang had "greatly increased" in 1960-61. In addition, indications are that a new standard-gauge track is under construction on parts of the North Vietnam rail line between Dong Dang and Hanoi. 32/

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* Estimate based on the national average of 22 freight cars to 1 locomotive.

** [redacted]

*** Probably to the iron and steel plant located at Lu-chia. [redacted]

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There also have been indications of stockpiling for improvements* of the track between Hanoi and Lao Kay on the K'un-ming - Hanoi Railroad. The Li-t'ang - Chan-chiang line has an estimated capability of approximately 11,900 tons EWP. Because of the relatively steep grades and numerous sharp curves encountered, the Liu-chou - Kuei-yang rail line has the lowest capability of the three railroads under the Liu-chou Bureau. The estimated capability of the Liu-chou - Kuei-yang line is 5,900 tons EWP.

III. Highway Transport

A. Yunnan Province

1. Network

In Yunnan Province, highway transport has maintained its historical primacy, but it has decreased in relative economic importance as the railroad network of the province has expanded. At present the railroad network of Yunnan is limited to the central industrial and mining areas because of the relatively large investment needed to construct and maintain rail lines. Roads, therefore, assume a much greater importance in the mountainous terrain of Yunnan than in the more densely populated industrial sections of China.

In 1961, there were approximately 23,500 km of motorable roads in Yunnan Province, an increase of 20,700 km of motorable roads above the total for 1949, as shown in Table 2.** A large amount of this new road construction, usually in the form of motorable tracks or one-lane earth roads,*** occurred in 1958 in the areas of the China-Burma, China-Laos, and China - North Vietnam borders. In addition, extensive reconstruction since 1955 has improved the capabilities of the existing motor routes of the province.

2. Major Routes

The most important road system, economically and militarily, in Yunnan Province and in the southern border region of China is the

* The type of improvement on this line is not known at this time. It is possible that this line will be double-tracked, but it is more likely that the improvements will be better passing facilities and roadbed in view of the extensive construction work that would be needed for double-tracking and the fact that long-range rail plans call for the eventual conversion from meter-gauge to standard-gauge track.

** Table 2 follows on p. 15.

*** The term motorable track refers to unimproved jeepable trails, whereas an earth road has some form of improvement such as grading, drainage, or stabilization.

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Table 2

Communist China: Estimated Length of the Motorable Highway Network
in Yunnan Province
1949 and 1957-61

Kilometers		
<u>Year</u>	<u>Total Network</u>	<u>Annual Additions</u>
1949	2,800 <u>a/</u>	N.A.
1957	11,900 <u>b/</u>	N.A.
1958	19,000 <u>c/</u>	7,100
1959	20,000 <u>d/</u>	1,000
1960	22,500 <u>e/</u>	2,500
1961	23,500 <u>f/</u>	1,000

- a. 33/
b. 34/
c. 35/
d. As of 1 October 1959. 36/
e. Estimated.
f. 37/

K'un-ming - Hsia-kuan - Pao-shan - Wan-t'ing road (route 1),* more commonly known as the Burma Road. This road, extending 958 km from K'un-ming to Wan-t'ing on the China-Burma border, is the main east-west transportation route in Yunnan as well as the primary land trade route between China and Burma. The road generally is surfaced with hard-packed gravel except for scattered blacktopping** and is two-way throughout except at bridges, which are generally one-way and limited to 10-ton loads. 38/ The Burma Road is estimated to have an over-all capability of 1,000 tons EWPD*** but is incapable of sustaining such

* For a description of routes and estimates of capability, see Table 9, Appendix A, p. 36, below. To facilitate discussion, the major highways of the southern border region have been assigned arbitrary numbers that bear no relation to actual highway numbers.

** The term blacktop probably refers to a low-grade, bituminous-treated gravel surface.

*** The capabilities of individual routes have been estimated

An average vehicle load of 3 tons has been used to obtain the total tonnage that could be moved on the route.

50X1
50X1
50X1

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heavy traffic without constant maintenance. Although the Burma Road has been improved in the last few years and generally is maintained in good condition, 40 to 60 percent of the road consists of curves, and much of the road is formed by cuts along mountainsides that are subject to landslides and undercutting during the rainy season. There is no comparable alternative route between China and Burma if the Burma Road should be interdicted.

There are, however, less satisfactory alternative routes to the Burma Road between China and Burma under construction or in being. From Pao-shan, on the Burma Road, a road (route 101) extends westward to T'eng-ch'ung. At T'eng-ch'ung an earth road (route 102) extends southeast to the Burma Road at Lung-ling, permitting a limited fair-weather alternative route between Pao-shan and Lung-ling. Another limited alternative route (route 103) exists from Mi-tu, on the Burma Road, to Kunlong in Burma. The Burmese extension of this road, however, probably is an earth road or track of low capability.

There are two important routes branching off the Burma Road to the north. The so-called Yunnan-Tibet Highway (route 104) leaves the Burma Road at Hsia-kuan and passes through Ta-li, Chiu-ho, Chu-tien, Wei-hsi, and Yeh-chih to A-tun-tzu. 40/ The state of construction north of Yeh-chih is not known, but because construction has been going on since 1953, it may be assumed that at least a single-lane fair-weather road has reached A-tun-tzu. This route has little economic significance and exists primarily to facilitate political and military control of the sparsely populated minority areas along the northern China-Burma border. The second route branching off to the north from the Burma Road is the road from Chen-nan to Hui-li (route 105) in Szechwan Province. This route has limited economic and military significance because of the rugged terrain and minor agricultural and mineral resources in north central Yunnan. The road passes through very mountainous terrain to Hui-li and is subject to deterioration during the wet season (May to September).

East of K'un-ming, the Burma Road (route 3) continues into Kweichow Province and is known as the Yunnan - Kweichow Highway. The highway parallels the railroad east to Chan-i, where it divides, with one branch going north through Wei-ning (route 301) in Kweichow Province to Nei-chiang in Szechwan Province. The other branch (route 3) extends east to Kuei-yang, the provincial capital of Kweichow. In 1955 the Chan-i - Kuei-yang section of route 3 was improved, 41/ and many curves, including the famous "24 curves" section, were eliminated or moderated. Route 301 from Chan-i to Wei-ning is a mountainous route roughly paralleling the Nei-chiang - K'un-ming rail line now under construction. This road reportedly was improved by the elimination of the steep grades and sharp curves north of Chan-i. 42/

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Southeast of K'un-ming a road (route 4) parallels the K'un-ming - Hanoi railroad to K'ai-yuan. From this road center a road (route 401) extends east to Yen-shan and then south to Thanh Thuy, North Vietnam, while a limited all-weather road (route 402) extends south to North Vietnam by way of Chin-ho.

The Kun-lo road (route 2), which extends southwest from K'un-ming through P'u-erh, Ssu-mao, and Ch'e-li to Ta-lo on the Burma border, is of little economic significance but of increasing military and political significance. At the Burma border the Kun-lo road extends to Keng Tung, Burma, by way of a track that was reported in 1958 as not motorable. ^{43/} At Ch'e-li (route 2) important roads branch east and west. One branch goes west to Fo-hai (route 201) and then runs northwest generally parallel to the China-Burma border to Meng-ting. East of Ch'e-li a single-vehicle-width earth road (route 203) extends southeast from Ch'e-li to Meng-pan, Meng-la, and to Meng-kang on the China-Laos border. In 1958, travel between this road and Phong Saly, Laos, was possible only on foot or by pack horse, but, reportedly, a motorable road is to be constructed from Meng-la to Phong Saly. ^{44/} The exact location of this road survey is not known, but the most probable route would be through Boun Neua to Phong Saly. This route is short, approximately 85 km, although it probably will be limited in capability and subject to serious deterioration during the wet season. In addition, [] the Chinese Communists have opened a road to Ban Botene in the Moug Sing area of Laos.

50X1

3. Performance

a. Volume of Traffic

It is estimated that various forms of road transport in Yunnan carried approximately 24 million to 25 million tons of freight in 1959, of which motor vehicles accounted for 5.9 million tons and primitive transport 18 million to 19 million tons.* Estimates of the tonnage carried by civilian trucks in Yunnan Province are shown in Table 3.** In 1960-61 the relative share of freight carried by motor vehicle in Yunnan probably declined because of the general shortage of gasoline throughout China.

* Although primitive transport generally is considered to be responsible for 75 percent of the freight transported by road in Communist China, ^{46/} it is likely, considering the rugged terrain of Yunnan, that primitive transport carried 75 to 80 percent of the freight carried by road in Yunnan.

** Table 3 follows on p. 18.

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Table 3

Communist China: Estimated Tonnage Carried by Civilian Trucks
in Yunnan Province
1955 and 1957-59

Year	Tonnage Carried (Metric Tons)	Annual Increase	
		Metric Tons	Percent
1955	794,200 <u>a/</u>	N.A.	N.A.
1957	1,382,400 <u>a/</u>	N.A.	N.A.
1958	3,180,000 <u>b/</u>	1,797,600	130 <u>b/</u>
1959	5,900,000 <u>b/</u>	2,720,000	86 <u>b/</u>

a. 47/
b. 48/

b. Commodity Composition of Traffic

Truck transport has a dual role in the movement of freight in Yunnan Province. Along the railroad in the east-central section of the province, motor transport serves as a feeder and auxiliary form of transport, but in the western and extreme eastern parts of the province it serves as the primary freight carrier. The commodity composition of freight transported by motor truck is principally raw materials moving to K'un-ming and finished goods flowing from K'un-ming to the rural population centers. Foodstuffs, timber, and industrial raw materials such as coal, coke, iron ore, and mineral ores constitute a large percentage of Yunnan's truck tonnage.

Because mining of coal and iron ore and production of steel center around K'un-ming, a large percentage of the traffic moving toward K'un-ming on the Burma Road (route 1) is material for these activities. The Hsia-kuan Highway Transport center reported 49/ shipping mine timbers to the I-p'ing-lang coal mines and coke to K'un-ming, along with grain, while taking chemical fertilizer from K'un-ming. Petroleum products in drums, machinery, chemical fertilizer, farm equipment, and consumer goods are transported from K'un-ming on the Burma Road and its branch roads, while lumber, tea, bamboo, salt, food grains, and industrial raw materials are the commodities transported to K'un-ming over these routes.

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On the Kun-lo road (route 2), consumer goods probably are shipped south. Tea, lumber, fruit, and rice are the probable items transported toward K'un-ming by truck. The volume of goods transported by civilian vehicles over this route is believed to be relatively small. Apparently the southern section of this road* and the roads branching from it along the border area are used more for political-military purposes than for trade.

Southeast of K'un-ming (route 4), truck transport is used primarily to haul phosphate rock, timber, coke, coal, iron ore, and foodstuffs. The K'ai-yuan General Transport Station, the south terminus of the K'un-ming - K'ai-yuan road, listed its important transport items as lumber, coke, and foodstuffs. 50/ This road generally parallels the railroad and is therefore of secondary importance as a mover of heavy freight. It is possible that arms are shipped into Laos via North Vietnam from K'ai-yuan. The most likely route would be K'ai-yuan to North Vietnam by way of Chin-ho (route 402), a road that connects with provincial route 41 inside North Vietnam. In April 1961 "thousands of Chinese laborers from Yunnan were working on provincial route 41 between Tuan Giao and Lai Chau." 50X1

Little information is available concerning the commodity composition of freight carried by truck on the roads northeast of K'un-ming. On routes 3 and 301, truck transport probably is engaged chiefly in hauling rail construction materials and consumer goods.

4. Inventory

The civilian truck park of Yunnan Province in 1960 is estimated to have contained from 6,200 to 7,300 vehicles.** The truck park is composed of Soviet,*** East German,[†] and US trucks,^{††} as well as Chinese Liberation trucks, most of which were built before 1949. A majority of civilian trucks probably are controlled by provincial authorities, with the remainder being operated by governmental mining and industrial enterprises.

Civilian trucks in Yunnan under provincial administration probably are controlled from K'un-ming, the site of the largest truck park in the province. Outside K'un-ming the truck park is divided

* South of Ssu-mao.

** For detailed methodology, see Appendix B, p. 41, below.

*** ZIS 150 and 151 and GAZ 51. 52/

[†] Unidentified diesel-powered trucks. 53/

^{††} Dodge, GMC, International, Ford, and Studebaker. Aside from the Studebaker, which was identified as a 1940 model, there were no indications of year or model. 54/

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among eleven "general transport stations." It is estimated that the K'un-ming park contains approximately 1,150 trucks, while the "general transport stations" of Chan-i and Hsia-kuan have about 370 55/ and 380 trucks, 56/ respectively. The locations of the remaining nine "stations" are not known, but important road centers such as Pao-shan, K'ai-yuan, and Ssu-mao are likely sites. There are at least two major overhaul points in the province. The K'un-ming Automobile Repair and Maintenance Shop, the larger of the two provincial repair shops, reportedly is capable of handling 2,000 major overhauls* per year. 57/ The Automobile Repair Shop at Hsia-kuan has the capacity to undertake the major overhaul of about 1,000 vehicles per year. 58/ Other repair shops, capable of minor repairs, are scattered along the major roads of the province.

B. Kwangsi Chuang Autonomous Region

1. Network

The road system of the Kwangsi Chuang Autonomous Region is of secondary economic importance compared to the rail lines and the inland waterways. As shown in Table 4, there were 13,237 km of motorable roads in the Kwangsi region in 1959, which was about three times the highest pre-1949 figure of 4,400 km. 59/ In addition, there were approximately 6,000 "country roads" (cart trails), totaling between 18,000 and 25,000 km in length.

Table 4

Communist China: Estimated Length of the Motorable Highway Network
in Kwangsi Chuang Autonomous Region
1952 and 1955-59

Kilometers		
<u>Year</u>	<u>Total Network</u>	<u>Annual Additions</u>
1952	4,543 <u>a</u> /	N.A.
1955	5,112 <u>b</u> /	N.A.
1956	7,270 <u>c</u> /	2,158
1957	8,800 <u>d</u> /	1,530
1958	11,000 <u>e</u> /	2,200
1959	13,237 <u>f</u> /	2,237
a. <u>60</u> /	c. <u>62</u> /	e. Estimated.
b. <u>61</u> /	d. <u>63</u> /	f. <u>64</u> /

* A major overhaul is considered to mean a complete dismantling and repair of a car or truck.

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Little construction of improved roads has been noted in Kwangsi. The emphasis in construction appears to be on "simple highways" -- fair-weather earth roads for use by carts, jeeps, and, in some cases, trucks. Probably a large percentage of this simple construction has taken place in the minority areas of western and northern Kwangsi in an effort to integrate these groups into the economy and to control local dissidence. It was planned to have 40,000 km of "simple highways" in Kwangsi by 1962, but the extent of construction in 1960-61 is not known.

2. Major Routes

All major urban and industrial centers in the Kwangsi region are served by rail or water transport. Therefore, the road system of Kwangsi functions mainly as an auxiliary system. The main highways of the region generally parallel the railroads, and there are few important "long roads" of the Yunnan type serving as major arteries of transport. The most important road in the Kwangsi region is the Heng-yang - Kuei-lin - Liu-chou - Nan-ning - North Vietnam road (route 5), which parallels the Heng-yang - P'ing-hsiang Railroad. Just north of P'ing-hsiang, about 18 km from the North Vietnam border, route 5 splits, with one branch going to Cao Bang, North Vietnam, by way of Lung-chou and the other going through P'ing-hsiang to the China - North Vietnam border at Chen-nan-kuan. This road is reported to be well maintained even though subject to possible deterioration during the wet season (May to September).

South of Liu-chou a road (route 3) branches off route 5 and parallels the rail line from Liu-chou to Kuei-yang in Kweichow Province. This road leaves route 5 at Ta-t'ang, passing through I-shan, Ho-chih, Ma-wei, and Tu-yun before reaching Kuei-yang. From Kuei-yang, route 3 extends to K'un-ming in Yunnan Province. From Pin-yang on route 5 a major road (route 6) parallels the Li-t'ang - Chan-chiang rail line to Chan-chiang. Route 6, which passes through T'an-t'ang, Yu-lin, and Lien-chiang, has several important roads branching from it. One branch road (route 601) extends from Yu-lin to Wu-chou, a major river port of the Pearl River System. Route 601 is surfaced with pressed earth or clay and is subject to serious deterioration in the wet season. Another branch road (route 602) extends to North Vietnam from Sui-ch'i on route 6. Route 602 follows the coast westward to Ch'in-hsien* and then continues along the coast to Tung-hsing on the China - North Vietnam border, where a newly built bridge over the Pei-lun River links route 602 with the North Vietnam road system.

* Also called Yamchow.

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From Nan-ning, route 7 extends northwest to K'un-ming in Yunnan Province. This road probably is improved earth or limited all-weather as far as Pai-se (Po-seh), but the surfacing and the condition of the road beyond this point are not known. A bus using this road in 1957 required 4-1/2 days to complete the approximate 800-km trip from Nan-ning to I-liang, 65/ indicating that the road was of limited capacity in 1957. At P'ing-ma, on route 7 between Nan-ning and Pai-se, an earth road (route 701), of marginal military significance, is motorable to Ching-hsi, approximately 90 km from Cao Bang, North Vietnam. Between Ching-hsi and Cao Bang, facilities for communications are believed to be maintained by a motorable track or earth road.

3. Performance

a. Volume of Traffic

Various forms of road transport in Kwangsi carried approximately 7,520,000 tons of freight in 1960, of which about 1,880,000 tons were transported by motor vehicle and 5,640,000 tons by primitive means.* The motor vehicle tonnage for 1960 was 57 percent above the total of 1.2 million tons for 1956. The bus system of Kwangsi carried 1,968,000 passengers in 1956. No information is available concerning the passenger traffic in 1960, but if the increase in tons carried in 1956-60 is applied to the bus system, nearly 3.1 million passengers were carried.

b. Commodity Composition of Traffic

Information concerning the commodity composition of freight carried by motor transport in Kwangsi is extremely limited. It is believed, however, that food grains, coal, iron ore, lumber, and mineral ores constitute the bulk of the tonnage carried. Generally, truck traffic is confined to short-haul feeder service for the railroads and inland waterways and to service in the immediate vicinity of the urban centers. The pattern of freight movement generally is raw materials and foodstuffs from the hinterland to urban centers, railroads, and waterways, whereas capital and consumer goods are hauled to the interior.

Route 5, the Heng-yang - Nan-ning - North Vietnam road, and the numerous small roads branching from it act as a feeder system

* The freight tonnage carried by truck was estimated on the in-service truck inventory of 1,716 vehicles carrying 3 tons per day, while freight carried by primitive means was estimated on the basis of the national average. See the footnote on p. 17, above.

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for the Heng-yang - Nan-ning - P'ing-hsiang Railroad and for waterways of the Pearl River System. In the area around Kuei-lin, tungsten, mercury, tin, lead, and zinc are transported to the railhead. Mercury, tin, and probably lumber are hauled to the Kuei Chiang (River) in the area of P'ing-lo, whereas rice, manganese, lead, and zinc are transported to other branches of the Pearl River System farther south. Iron ore, pyrites, and sulphur are transported to the railroad and river port at Liu-chou, while such goods as salt, farm tools, seed, and consumer goods are trucked to the interior. 66/ Around Nan-ning and Pin-yang, such produce as rice, fruits, and forestry products and such minerals as tungsten and antimony move toward the urban centers. South of Nan-ning on route 5, trade with North Vietnam carried by motor transport is believed to be mainly local produce of little economic significance. On route 3 between Liu-chou and Kuei-yang, tung oil, manganese ore, coal, and medicinal herbs are moved toward the rail line by truck and primitive transport. In addition, such minerals as antimony, tin, sulphur, gypsum, and mercury are transported on route 3 and its branch roads to rail facilities along the Liu-chou - Kuei-yang rail line.

On route 6 and its complex of branch roads, rice probably is a major item transported as well as forestry products, fruits, and possibly some iron ore. It is likely that some manganese ore is transported by truck from mines north of route 602 to the port of Pei-hai and possibly to Chan-chiang.

On route 7 and its branch roads in western Kwangsi the motor truck is the principal long-distance carrier. Little information is available concerning the commodity composition of freight in this rugged and sparsely populated area, but it is probable that such agricultural products as rice, corn, barley, wheat, beans, and peas are shipped east to Pai-se and Nan-ning in exchange for manufactured goods and farm implements.

4. Inventory

It is estimated that the civilian truck park of the Kwangsi Chuang Autonomous Region was approximately 2,145* vehicles in 1960. In addition, there were at least 925 trailers in operation. In 1959, about 82 percent of the truck park was in operating condition, 67/ but it is possible that in 1961 the rate of in-service vehicles has decreased. This decrease is due to the use of nonpetroleum fuels in place of gasoline, resulting in an increased rate of mechanical failures.

* For detailed methodology, see Appendix B.

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IV. Water Transport

A. Inland Waterways

1. Yunnan Province

The inland waterways of Yunnan Province are of little economic or strategic significance. Generally the rivers of Yunnan can be described as swift-flowing streams running through steep-sided valleys or canyons with many rapids, shallows, and other navigational hazards. Laboring under these handicaps, inland water transport has made little progress in Yunnan, and, barring massive investment of capital and labor, no significant increase in Yunnan's inland waterway capacity is foreseen.

The few navigable routes in the province are short, usually shallow, beset with hazards, and disconnected. On the Chin-sha River in northwestern Yunnan a 153-km section in the vicinity of Shih-ku has been reported 68/ as open to navigation. There are six waterfalls along this route. It is likely that this section is navigable only by shallow-draft vessels. The Nan-p'an River is reported as open for navigation below P'an-chi. 69/ It is probable, however, that only small native vessels can be used on the Yunnan section of this river. The Yuan Chiang (Red River) is navigable in Yunnan from Yuan-chiang to Ho-k'ou by shallow-draft native boats. Although the water level is low in the dry season (October to April), during the rest of the year shallow-draft tugboats and lighters probably can use the river on the 110-km section between Man-hao and Ho-k'ou. From Ho-k'ou a water transport route of limited capability* is available to the gulf of Tonkin by way of the Yuan Chiang (Red River) through North Vietnam. Within Yunnan the Mekong River is navigable by small native vessels for relatively short distances. In addition to the rivers of Yunnan, two lakes, the Tien Ch'ih, south of K'un-ming, and the Erh Hai, near Ta-li, are open to small motor vessels.

2. Kwangsi Chuang Autonomous Region

The Kwangsi Chuang Autonomous Region is relatively well served by the inland water transport facilities of the Pearl River System.** The Hsi Chiang (West River) of the Pearl System is formed

* In the high-water season, May to September, vessels drawing as much as 7 feet can reach Lao Kay, North Vietnam. At low-water season, however, only shallow-draft native boats can navigate north of Bao Ha, North Vietnam.

** The Pearl River System comprises the complex of rivers that enter the South China Sea via the Chu Chiang (Pearl River) estuary. It incorporates the Tung, Pei, and Hsi Rivers and their tributaries.

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at Wu-chou near the provincial border of Kwangsi and Kwangtung by the Hsun Chiang* and the Kuei Chiang. These three rivers form the primary east-west water transportation link for the Kwangsi region and provide Kwangsi with an outlet to the sea.

In 1957 the inland waterways of the Kwangsi region totaled 7,794 km, 70/ of which 2,475 km 71/ were open to motorized vessels. The most important river port in the Kwangsi region is Wu-chou, located 330 km up the Hsi Chiang, the limit of navigation for small oceangoing vessels. This port can accommodate vessels with a draft of about 13 feet at high water and 6 feet at low water. 72/ From Wu-chou, 530 km to Nan-ning, the provincial capital of Kwangsi, the Hsun Chiang is capable of at least 2-foot to 4-foot drafts, while above Nan-ning shallow-draft vessels can reach Pai-se. The Liu Chiang, a tributary of the Hsun Chiang, is navigable at least as far as Liu-chou. The Kuei Chiang, the second of the two tributaries which form the Hsi Chiang at Wu-chou, is navigable to about Kuei-lin in the northern part of Kwangsi.

The major commodities moving downstream on the rivers of Kwangsi are foodstuffs, wood products, livestock, lumber, and coal. Petroleum is shipped upriver, with the empty drums being returned to Canton. Other cargoes moving upstream are finished goods, machine parts, processed foods, chemicals, and fertilizers.

B. Coastal Shipping

Coastal shipping along the southern border region of China is of secondary economic importance. The development of important settlements and ports has been limited by generally poor anchorages and by the relatively low agricultural potential of the coastal lowlands. Junks account for all but a fraction of the commodities moved by coastal shipping in this area. The commodities transported are similar to those moving on the inland waterways of Kwangsi. Mineral and agricultural products are generally transported north to Chan-chiang, Whampoa, and Canton, while consumer goods, petroleum products, and manufactured goods are transported south.

This area has two important ports, Pei-hai** and Chan-chiang. Pei-hai is a comparatively small port between Chan-chiang and North Vietnam and is used chiefly by junks and small modern vessels. The port, however, is limited by shallow water in the harbor area, which

* This tributary of the Hsi Chiang is called the Hsun Chiang from Kuei-p'ing to Wu-chou and the Yu Chiang from Kuei-p'ing to Nan-ning. For simplicity it has been identified throughout the report as the Hsun Chiang.

** Located at 21°48' N - 109°01' E.

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requires oceangoing vessels to stand about 1 km offshore. 73/ On the other hand, Chan-chiang is one of the best natural harbors along the south China coast and potentially one of the most important mainland ports south of Taiwan. At present, Chan-chiang is reported to be capable of handling up to 10,000-ton oceangoing dry cargo vessels. Tankers up to 25,000 tons 74/ can be accommodated at a special pier in the southern section of the harbor. In addition, the largest vessels afloat can be anchored in the protected outer harbor and serviced by lighters. The port is a rail terminal with modern facilities for handling cargo* as well as facilities for storing petroleum.** The port area has approximately 282,000 square feet of warehouse space and sufficient open storage for present port operations. In 1957, Chan-chiang loaded and unloaded approximately 1.6 million tons of freight. 75/ A large percentage of the freight shipped from the port was the ores and agricultural raw materials of the interior served by the Li-t'ang - Chan-chiang Railroad. Consumer goods, petroleum products, machinery, chemicals and fertilizers, and iron and steel products were the principal commodities received. When all planned port construction is completed in the mid-1960's, the capacity of the port will be approximately 4.6 million tons per year. 76/

V. Air Transportation

The rugged terrain and relatively poor land transport facilities of the southern border region of China make air transport a convenient if limited form of transport. In addition to service within the southern border region, international flights originate twice a week from Nan-ning to Hanoi, North Vietnam, and from K'un-ming to Rangoon, Burma. Service from Canton to Ceylon via K'un-ming and Rangoon has been under consideration for several years but has not yet been instituted. Within Yunnan, several intraprovincial flights link K'un-ming with other sections of the province. These flights, usually using An-2 aircraft, are made to Pao-shan, Ssu-mao, and Chao-tung. 77/ Although some airfields of the area can accept turbine-powered craft, most civilian flights are made with Il-14,*** Li-2,[†] and An-2^{††} aircraft. These aircraft, although relatively slow and limited in cargo capacity, have characteristics that are valuable in this area: short landing and take-off requirements, unsophisticated ground and repair equipment needs, and general reliability.

* Eight wharf cranes, all 5-ton portal jibs, and one 25-ton floating crane. Possibly two 10-ton cranes and one 45-ton floating crane will be constructed.

** The petroleum terminal has an estimated storage capacity of 160,000 barrels.

*** The Il-14 is a two-engine aircraft, seating between 18 and 32 passengers or carrying between 4,700 and 8,100 pounds of cargo.

[†] The Li-2 is the Soviet model of the DC-3 (C-47), carrying up to 19 passengers or between 3,300 and 6,600 pounds of cargo.

^{††} The An-2 is a single-engine biplane, carrying up to 10 passengers.

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APPENDIX A

STATISTICAL TABLES

The tables that follow represent a compilation of some of the data necessary for estimating the capabilities of the transportation system of the southern border region of Communist China. Railroad stations in 1960 on the Heng-yang - Nan-ning - P'ing-hsiang Railroad, the Li-t'ang - Chan-chiang (Fort Bayard) Railroad, the Liu-chou - Kuei-yang Railroad, and the K'ung-ming - Ho-k'ou Section of the K'ung-ming - Hanoi Railroad are given in Tables 5 through 8.* Descriptions and estimated capabilities of the highway routes in the southern border region are given in Table 9.**

* Tables 5 through 8 follow on pp. 28 through 35.

** Table 9 follows on p. 36.

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Table 5

Communist China:
Stations on the Heng-yang - Nan-ning - P'ing-hsiang Railroad a/
1960

<u>Stations</u>	<u>Number of Kilometers</u>	
	<u>From Heng-yang</u>	<u>From Nan-ning</u>
Heng-yang	0	793
West Heng-yang	6	787
San-t'ang	18	775
T'an-tzu-shan	34	759
Chi-lung-chieh	44	749
Pai-hao-p'u	56	737
Hung-ch'iao	63	730
Feng-shih-yen	75	718
Pai-ti-shih	82	711
Li-chia-p'ing	98	695
Ta-ts'un-tien	105	688
Huang-yang-ssu	119	674
Kao-ch'i-shih	131	662
Leng-shui-t'an	141	652
Lan-chia-ts'un	154	639
Ching-t'ou-hsu	165	628
Tung-an	177	616
Tzu-ch'i	187	606
Huang-t'u-ching	196	597
Miao-t'ou	206	587
Huang-sha-ho	215	578
Yung-sui	226	567
Ch'uan-chou	239	554
Ts'ai-wan	248	545
Shao-shui	262	531
Hsien-shui	272	521
Pai-li-ts'un	284	509
Hsing-an-hsien	299	494
Yen-kuan-hsiang	309	484
Ta-yung-chiang	320	473
Ling-ch'uan	337	456
Kan-t'ang-tu	346	447
North Kuei-lin	356	437
Kuei-lin	362	431
Erh-t'ang	373	420

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Table 5

Communist China:
Stations on the Heng-yang - Nan-ning - P'ing-hsiang Railroad
1960
(Continued)

<u>Stations</u>	<u>Number of Kilometers</u>	
	<u>From Heng-yang</u>	<u>From Nan-ning</u>
Heng-shan	383	410
Ta-ch'i-ho	395	398
Yung-fu	403	390
P'u-t'ao	419	374
Ai-ling	434	359
P'o-chai	446	347
Ta-tuan-ho	N.A.	N.A.
Huang-mien	459	334
Yu-lan	469	324
Hsin-ts'un	478	315
Lu-chai	488	305
Tui-t'ing	497	296
Lo-jung	505	288
Lo-fou	516	277
Che-ku-chiang	528	265
North Liu-chou	535	258
Liu-chou	538	255
Chin-te	550	243
Pai-p'eng	561	232
Pai-shan	571	222
Feng-huang	585	208
Wei-tu	598	195
Lai-pin	608	185
Liang-chiang	619	174
P'ing-t'ang	632	161
Meng-shan	640	153
Hsiao-p'ing-yang	647	146
Ho-chi-ts'un	662	131
Li-t'ang	673	120
Jen-chu	687	106
Lu-hsu	701	92
Lu-ts'un	716	77
Liu-ching	728	65

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Table 5

Communist China:
Stations on the Heng-yang - Nan-ning - P'ing-hsiang Railroad
1960
(Continued)

<u>Stations</u>	<u>Number of Kilometers</u>	
	<u>From Heng-yang</u>	<u>From Nan-ning</u>
Ling-li	741	52
Ch'ang-t'ang	753	40
Wu-ho	767	26
T'un-li	779	14
Nan-ning	793	0
Chin-chi-ts'un	810	17
Chiang-hsi-ts'un	819	26
Wei-lo	828	35
Yung-kuan-ling	841	48
Fu-nan	848	55
Ch'u-li	864	71
Ta-ling	874	81
Ch'u-chiu	887	94
Lai-t'uan	899	106
Ch'ung-shan	915	122
Ku-p'o	927	134
T'ien-hsi	942	149
T'ing-liang	952	159
Lung-pai-t'un	963	170
Ning-ming	970	177
K'uei-t'ang	981	188
Hsia-shih	990	197
Shang-shih	998	205
P'ing-hsiang	1,013	220

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Table 6

Communist China:
Stations on the Li-t'ang - Chan-chiang (Fort Bayard) Railroad a/
1960

Stations	Number of Kilometers	
	From Li-t'ang	From Chan-chiang (Fort Bayard)
Li-t'ang	0	315
Feng-ming	7	308
Chu-shih	15	300
Fu-lung-chiang	25	290
T'an-t'ang	34	281
Ken-chu	44	271
Kuei-hsien	54	261
Pa-t'ang	67	248
Ch'iao-hsu	79	236
P'eng-t'ang	90	225
Shih-ku-t'ang	101	214
Shih-nan	110	205
San-shan	123	192
Jen-tung	135	180
Yu-lin	144	171
Ma-p'o	157	158
Mi-ch'ang	169	146
Lu-ch'uan	180	135
Mei-p'o	190	125
Chin-chi	200	115
Wen-li	209	106
Wen-ti	223	92
Fo-tzu-ling	234	81
P'o-chi	245	70
Ho-ch'un	254	61
Lien-chiang	263	52
Lung-t'ang	275	40
Sui-ch'i	288	27
T'ang-k'ou	298	17
Chan-chiang-pei (Fort Bayard North)	307	8
Chan-chiang (Fort Bayard)	315	0

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Table 7

Communist China: Stations on the Liu-chou - Kuei-yang Railroad a/
1960

Stations	Number of Kilometers	
	From Liu-chou	From Kuei-yang
Liu-chou	0	607
Hsin-yu	11	596
T'ai-yang-ts'un	16	591
Lo-man	26	581
Liu-shan	35	572
Ta-shih	41	566
San-ch'a	54	553
Lo-tung	63	544
Lo-hsi	77	530
I-shan	89	518
Yeh-mao	100	507
Huai-yuan	111	496
Ch'uan-ts'un	119	488
Te-sheng	131	476
Tu-chieh	143	464
Tung-chiang	152	455
Chin-ch'eng-chiang	164	443
Liu-chia	178	429
Chia-pi-t'un	188	419
Pa-kung	199	408
Ch'ang-shan	205	402
Ts'e-lin	214	393
Pa-yu	230	377
Yao-chai	243	364
Kuan-hsi	250	357
Nan-tan	262	345
Hsing-tien	274	333
La-ma	281	326
Tung-ch'en	289	318
Szu-t'ing	300	307
Ma-wei	314	293
Chu-shih-chai	321	286
Hsing-lang	333	274
Feng-tung	345	262

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Table 7

Communist China: Stations on the Liu-chou - Kuei-yang Railroad
1960
(Continued)

<u>Stations</u>	<u>Number of Kilometers</u>	
	<u>From Liu-chou</u>	<u>From Kuei-yang</u>
Shou-tung	354	253
Ta-yang	361	246
Chia-p'u	376	231
Tu-shan	388	219
Shen-ho	403	204
Ta-p'ing	415	192
Ping-wu'	424	183
Mo-ts'un	434	173
Tung-ch'ing-shu	444	163
Tu-yun	461	146
Ch'ing-t'ai-p'o	467	140
Yang-liu-chieh	479	128
Lo-fou	491	116
Ku-t'ung	498	109
Lo-p'ing	509	98
Kuan-yin-ko	524	83
Kuei-ting	531	76
Wei-chia-chuang	N.A.	N.A.
Kao-p'ing-p'u	546	61
Ma-chih-p'u	563	44
Lung-li	569	38
Ta-t'u	586	21
Ku-li	593	14
South Kuei-yang	599	8
Kuei-yang	607	0

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Table 8

Communist China: Stations on the K'un-ming - Ho-k'ou Section
of the K'un-ming - Hanoi Railroad a/
1960

Stations	Number of Kilometers	
	From K'un-ming	From Ho-k'ou
South K'un-ming	0	469
Hsiao-hsi-ts'un	13	456
Ch'eng-kung	21	448
San-chia-ts'un	31	438
Shui-t'ang	39	430
Feng-ming-ts'un	51	418
K'o-pao-ts'un	56	413
Chiang-t'ou-ts'un	65	404
I-liang	71	398
Yang-chieh-tzu	78	391
Kou-chieh-tzu	86	383
Ti-shui	98	371
Hsu-chia-tu	111	358
Lu-feng-ts'un	125	344
No-tsu	137	332
Hsi-erh	154	315
Hsia-ho-k'ou	163	306
P'an-ch'i	173	296
Je-shui-t'ang	184	285
Hsi-ch'e-i	194	275
La-li-hei	203	266
Hsun-chien-ssu	213	256
Teng-lung-shan	N.A.	N.A.
Hsiao-lung-t'an	233	236
K'ai-yuan	249	220
Yu-lin-shan	N.A.	N.A.
Ta-t'a	261	208
Ta-chuang	276	193
Ts'ao-pa	284	185
Yu-kuo-p'u	N.A.	N.A.
Pi-se-chai	292	177
Hei-lung-t'an	305	164
Chih-ts'un	317	152

a. 81/

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Table 8

Communist China: Stations on the K'un-ming - Ho-k'ou Section
of the K'un-ming - Hanoi Railroad
1960
(Continued)

<u>Stations</u>	<u>Number of Kilometers</u>	
	<u>From K'un-ming</u>	<u>From Ho-k'ou</u>
Lo-shui-tung	326	143
Ko-ku	338	131
Lo-ku	349	120
P'o-tu-ching	363	106
Wan-t'ang	376	93
Pai-chai	388	81
La-ha-ti	399	70
Ta-shu-t'ang	414	55
Lao-fan-chai	426	43
Ma-chieh	441	28
Nan-ch'i	447	22
Ma-huang-p'u	455	14
Shan-yao	463	6
Ho-k'ou	469	0

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Table 9

Communist China: Description and Estimated Capabilities
of Selected Highway Routes in the Southern Border Region a/*
1961

Description of Route	Vehicles EWPB <u>b</u> /	Metric Tons EWPB <u>c</u> /
Burma Road (route 1) (958 km) <u>d</u> /		
A limited all-weather route at least 18 to 20 feet wide surfaced with gravel except for blacktopping in the K'un-ming area, in the immediate vicinity of larger cities, and south of Mang-shih. The terrain generally is mountainous, and the condition of the road probably is fair to good. <u>82</u> /	335	1,000
Pao-shan - T'eng-ch'ung - Ying-chiang (route 101) (240 km)		
a. Pao-shan - T'eng-ch'ung (150 km)		
A limited all-weather route about 18 to 20 feet wide surfaced with crushed rock. <u>83</u> / The terrain is mountainous, and the condition of the road is believed to be fair.	270	810
b. T'eng-ch'ung - Ying-chiang (90 km)		
A fair-weather earth route about 15 feet wide. <u>84</u> / The terrain is mountainous, and the condition of the road is unknown.	175	525
T'eng-ch'ung - Lung-ling (route 102) (60 km)		
A fair-weather earth route estimated to be 15 feet wide. <u>85</u> / The terrain is mountainous, and the condition of the road is unknown.	175	525
Mi-tu - Kunlong (route 103) (590 km)		
a. Mi-tu - Mien-ning (315 km)		
A limited all-weather route <u>86</u> / estimated to be 15 to 17 feet wide. The terrain is mountainous, and the condition of the road is fair.	265	800
b. Mien-ning - Kunlong (275 km)		
Probably an earth route about 15 feet wide, with possibly scattered sections of limited all-weather surface. <u>87</u> / The terrain is mountainous, and the condition of the road is unknown.	175	525
Hsia-kuan - A-tun-tzu (route 104) (640 km)		
a. Hsia-kuan - Chiu-ho (225 km)		
A limited all-weather route surfaced with crushed rock, estimated to be approximately 20 feet wide. <u>88</u> / The terrain is mountainous, and the condition of the road probably is fair.	305	915
b. Chiu-ho - Yeh-chih (280 km)		
A fair-weather earth route estimated to be 15 feet wide in mountainous terrain. <u>89</u> /	175	525

* Footnotes for Table 9 follow on p. 39.

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Table 9

Communist China: Description and Estimated Capabilities
of Selected Highway Routes in the Southern Border Region a/
1961
(Continued)

Description of Route	Vehicles EWPD <u>b/</u>	Metric Tons EWPD <u>c/</u>
c. Yeh-chih - A-tun-tzu (135 km)		
Probably a fair-weather earth route about 15 feet wide in mountainous terrain. <u>90/</u>	175	525
Chen-nan - Hui-li (route 105) (255 km)		
a. Chen-nan - Ta-yao (75 km)		
A limited all-weather earth-bound macadam route <u>91/</u> estimated to be about 15 feet wide. The terrain is mountainous, and the condition of the road probably is fair.	235	700
b. Ta-yao - Hui-li (180 km)		
Probably a limited all-weather route about 15 feet wide, at least as far as the Yunnan-Kweichow border. The condition of the road is unknown.	N.A.	N.A.
K'un-ming - P'u-erh - Ch'e-li - Ta-lo (route 2) (650 km)		
A limited all-weather route 18 to 20 feet wide generally surfaced with gravel. <u>92/</u> The terrain is mountainous, and the condition of the road is believed to be fair.	305	915
Fo-hai - Lan-ts'ang - Keng-ma - Meng-ting (route 201) (395 km)		
a. Fo-hai - Lan-ts'ang (150 km)		
A limited all-weather route at least 18 to 20 feet wide surfaced with crushed rock. <u>93/</u> The terrain is mountainous, and the condition of the road is believed to be fair.	305	915
b. Lan-ts'ang - Keng-ma (180 km)		
Believed to be an earth road about 12 to 15 feet wide. The terrain is mountainous, and the condition of the road is unknown.	150	450
c. Keng-ma - Meng-ting (65 km)		
A limited all-weather route 12 feet wide surfaced with crushed rock. <u>94/</u> The terrain is mountainous, and the condition of the road probably is fair.	205	615
Lan-ts'ang - Meng-ma - Burma Border (route 202) (105 km)		
a. Lan-ts'ang - Meng-ma (75 km)		
A limited all-weather route probably 12 to 15 feet wide surfaced with crushed rock. <u>95/</u> The terrain is mountainous, and the condition of the road is believed to be fair.	230	690

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Table 9

Communist China: Description and Estimated Capabilities
of Selected Highway Routes in the Southern Border Region a/
1961
(Continued)

Description of Route	Vehicles EWPD <u>b/</u>	Metric Tons EWPD <u>c/</u>
b. Meng-ma - Burma Border (30 km)		
The section is believed to consist of jeep trails of limited capability. <u>96/</u>	50	150
Ch'e-li - Meng-pan - Meng-la - Laos Border (route 203) (265 km)		
Believed to be earth surfaced and 12 to 15 feet wide. <u>97/</u> The terrain is mountainous, and the condition of the road probably is fair.	170	510
K'un-ming - Kuei-yang - Ta-t'ang (route 3) (1,250 km)		
a. K'un-ming - Chan-i (200 km)		
A limited all-weather route estimated to be 18 to 20 feet wide with a gravel surface. <u>98/</u> The terrain is believed to be mountainous, and the condition of the road probably is fair.	305	915
b. Chan-i - Kuei-yang - Ta-t'ang (1,050 km)		
A limited all-weather route 15 to 17 feet wide with a gravel surface. The terrain is mountainous, and the condition of the road is fair.	265	800
Chan-i - Wei-ning (route 301) (250 km)		
A limited all-weather surface probably 15 to 17 feet wide. The terrain is mountainous, and the condition of the road is unknown.	265	800
K'un-ming - K'ai-yuan (route 4) (250 km)		
A limited all-weather route probably surfaced with crushed rock and 12 to 15 feet wide. The terrain is hilly to mountainous, and the condition of the road probably is fair.	230	690
K'ai-yuan - Yen-shan - Wen-shan - Thanh Thuy (route 401) (285 km)		
a. K'ai-yuan - Yen-shan - Wen-shan (180 km)		
A fair-weather route probably 12 to 14 feet wide. <u>99/</u> The terrain probably is mountainous, and the condition of the road is fair.	170	510
b. Wen-shan - Thanh Thuy (105 km)		
Probably a jeep trail or an earth road of low capability. <u>100/</u>	50	150
K'ai-yuan - Meng-tzu - Chin-ho - North Vietnam (route 402) (175 km)		
A limited all-weather gravel route about 12 to 14 feet wide. <u>101/</u> The terrain is mountainous, and the condition of the road is believed to be fair.	205	615

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Table 9

Communist China: Description and Estimated Capabilities
of Selected Highway Routes in the Southern Border Region a/
1961
(Continued)

Description of Route	Vehicles EWPD <u>b/</u>	Metric Tons EWPD <u>c/</u>
Heng-yang - Kuei-lin - Liu-chou - Nan-ning - North Vietnam (route 5) (1,150 km)		
Probably a limited all-weather route at least 15 to 17 feet wide surfaced with gravel. <u>102/</u> The terrain is believed to be hilly, and the condition of the road is fair.	355	1,065
Pin-yang - Chan-chiang (Fort Bayard) (route 6) (400 km)		
Probably a limited all-weather route at least 12 to 14 feet wide. <u>103/</u> The terrain is believed to be hilly, and the condition of the road is unknown.	305	915
Yu-lin - Wu-chou (route 601) (230 km)		
Possibly a limited all-weather route 18 to 20 feet wide surfaced with pressed earth or clay. <u>104/</u> The terrain is hilly, and the condition of the road is fair.	305	915
Sui-ch'i - Ch'in-hsien - Tung-hsing (route 602) (360 km)		
Most of this route is believed to be of limited all-weather construction and 18 to 20 feet wide. <u>105/</u> The terrain varies from coastal lowland to hilly, and the condition of the road probably is fair.	410	1,230
Nan-ning - Pai-se - I-liang (route 7) (800 km)		
a. Nan-ning - Pai-se (290 km)		
Probably an improved earth or a limited all-weather route 15 to 17 feet wide. The terrain is hilly, and the condition of the road is unknown.	315	945
b. Pai-se - I-liang (510 km)		
Probably a single-lane earth road.	175	525
P'ing-ma - Ching-hsi - North Vietnam (route 701) (215 km)		
a. P'ing-ma - Ching-hsi (125 km)		
A fair-weather route probably about 12 to 14 feet wide. <u>106/</u> The terrain is mountainous, and the condition of the road probably is fair.	170	510
b. Ching-hsi - North Vietnam (90 km)		
Probably jeep trails or earth road of low capability.	50	150
a. Estimates refer to traffic on the highways under moist conditions, a term that refers to subsoil and not to seasonal weather conditions. For the graphic location of highway routes in Yunnan Province, see the map, inside back cover.		
b. Each way per day.		
c. Each way per day, assuming an average load of 3 metric tons per vehicle.		
d. Estimated road distance.		

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APPENDIX B

METHODOLOGY

1. Rail Capability

The information available on the railroads was insufficient both in quantity and in detail to provide more than an approximation of the capability of the rail lines in Kwangsi and Yunnan Provinces.

[redacted] It is assumed that all stops [redacted] were stations with sidings long enough to permit trains to pass in opposite directions. Probably there also are sidings between these stops, but no information is available on locations of the sidings other than at the local stops [redacted] It was assumed further that the efficiency factor* was 0.6 in Kwangsi Province and 0.5 in Yunnan Province. It should be noted that the results given below are estimates of maximum capacity for the movement of economic traffic. Because military items would not be so heavily loaded as bulk economic commodities, the net tonnage per train for military items would be less. To determine the capability of a line the following formula was used:

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$$N = \frac{1440}{RT + 7} \times 0.6$$

where

N is the density in number of trains per day,
1,440 is the minutes in 24 hours,
RT is the running time between sidings at 25.7 per hour,
7 is the delay time in minutes for meeting trains
from the opposite direction, and
0.6 is the efficiency factor.

* The efficiency factor takes into account inevitable operating delays based on the type of signaling, as follows:

0.5, telephone and ticket and rudimentary signaling,
0.6, manual block signaling,
0.75, automatic signaling, and
0.85, centralized train control.

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a. Kwangsi Chuang Autonomous Region

(1) Heng-yang - Nan-ning - P'ing-hsiang Line

On this line an average speed of 25.7 km per hour* and an estimated average load per train of 1,100 tons 109/ were used to estimate capability. The maximum distance between stations is 17 km, the distance between Nan-ning and Chin-chi-ts'un.

$$N = \frac{1440}{40 + 7} \times 0.6$$

N = 18.38 trains both ways per day (BWPD). This number of trains with a net load of 1,100 tons each gives a line tonnage of about 20,218 tons BWPD or about 10,100 tons EWPd.

(2) Li-t'ang - Chan-chiang (Fort Bayard) Line

An average load weight of 1,100 tons per train and an average speed of 25.7 km per hour were used to estimate capability. The maximum distance between stations is 14 km, the distance between Wen-li and Wen-ti.

$$N = \frac{1440}{33 + 7} \times 0.6$$

N = 21.60 trains BWPD. This number of trains with a net load of 1,100 tons each gives a line tonnage of about 23,760 tons BWPD or about 11,900 tons EWPd.

(3) Liu-chou - Kuei-yang Line

The computation of the capability of the Liu-chou - Kuei-yang line differed slightly from the two other lines of the Liu-chou Bureau. Because of the more difficult terrain, the average speed per train is estimated to be 18 km per hour rather than 25.7 km. An average load of 900 tons per train 110/ was used in the formula for capability. The passing time component used in the formula for capability is 9 minutes as opposed to 7 minutes used for the other lines. The maximum distance between stations is 17 km, the distance between Kao-p'ing-p'u and Ma-chih-p'u.

* 1958 national average.

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$$N = \frac{1440}{57 + 9} \times 0.6$$

N = 13.09 trains BWP. This number of trains with a net load of 900 tons each gives a line tonnage of about 11,780 tons BWP or about 5,900 tons EWP.

b. Yunnan Province

(1) K'un-ming Railroad Administration

The only line of the K'un-ming Railroad Administration on which sufficient information is available to form an estimate of capability is the main line of Yunnan, the K'un-ming to Hanoi railroad. The section that limits the capability of this line is that between Pi-se-chai and Shan-yao in Yunnan. The speed of trains is estimated to be 21 km per hour, 111/ and the average load about 225 tons per train. The passing time component used in the formula for capability was 9, and the efficiency factor was 0.5. The maximum distance between stations is 17 km, the distance between No-tsu and Hsi-erh.

$$N = \frac{1440}{49 + 9} \times 0.5$$

N = 12.41 trains BWP. This number of trains with a net load of 225 tons each gives a line tonnage of about 2,800 tons BWP or about 1,400 tons EWP.

2. Civilian Motor Truck Park

a. Kwangsi Chuang Autonomous Region

Little information is available concerning the inventory of trucks for Kwangsi. [] in 1957 stated that Kwangsi had "over 1,000 motor vehicles in operating condition." 112/ On the basis of this information and on the assumptions that "over 1,000" means about 1,100, that the term motor vehicles refers to trucks, and that the inventory of Kwangsi grew at the same rate as the national average,* the estimate for 1960 would be about 1,716 trucks in operating condition. Allowing for an estimated 80 percent in service rate, the total inventory of civilian trucks for Kwangsi in 1960 was about 2,145 trucks.

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* An increase of 56 percent between 1957 and 1960.

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